PROPOSED
TOTAL MAXIMUM DAILY LOADS (TMDLs)

For Chlordane, Dioxins, and Polychlorinated Biphenyls (PCBs) in the Loosahatchie River

Loosahatchie River Watershed (HUC 08010209)
Shelby County Tennessee

FINAL

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ATSDR	Agency for Toxic Substances and Disease Registry
ADB	Assessment Database
BCF	Bioconcentration Factor
BMP	Best Management Practices
CAS	Chemical Abstract Service
CDD	Chlorinated Dibenzo-p-Dioxin
CDF	Chlorinated Dibenzofuran
CFR	Code of Federal Regulations
CFS	Cubic Feet Per Second
HHC	Human Health Criteria
HUC	Hydrologic Unit Code
LA	Load Allocation
MOS	Margin of Safety
MRLC	Multi-Resolution Land Characteristic
MS4	Municipal Separate Storm Sewer System
ND	Non-Detect
NHD	National Hydrography Dataset
NPL	National Priorities List
NPS	Non-point Source
NPDES	National Pollutant Discharge Elimination System
PCB	Polychlorinated Biphenyl
PPB	Parts per Billion
PPM	Parts per Million
PPQ	Parts per Quadrillion
PPT	Parts per Trillion
RI/FS	Remedial Investigation and Feasibility Study
ROD	Record of Decision
RM	River Mile
TDEC	Tennessee Department of Environment & Conservation
TDSWM	Tennessee Division of Solid Waste Management
TEF	Toxic Equivalent Factor
TMDL	Total Maximum Daily Load
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WLA	Waste Load Allocation
WWTF	Wastewater Treatment Facility

SUMMARY SHEET

LOOSAHATCHIE RIVER WATERSHED (HUC 08010209)

Total Maximum Daily Loads for Chlordane, Dioxins, and Polychlorinated Biphenyls (PCBs) As Identified on the State of Tennessee's *2008 303(d) List*

Impaired Waterbody Information:

State: Tennessee
County: Shelby
Watershed: Loosahatchie River Watershed (HUC 08010209)
Constituents of Concern: Chlordane, Dioxins, and Polychlorinated Biphenyls (PCBs)

Impaired Waterbodies Addressed in This Document:

Waterbody ID	Impaired Waterbody	Miles
TN08010209001_1000	Loosahatchie River	7.8
TN08010209002_1000	Loosahatchie River	10.3

Designated Uses:

The designated use classifications for segments of the Loosahatchie River addressed in this TMDL include fish and aquatic life, irrigation, livestock watering & wildlife, and recreation.

Target Criteria:

Fish tissue concentrations, calculated from the formulas used for fish advisories, will be used as the target criteria.

Pollutant	Target Criteria (mg/kg)
Chlordane	0.1143
Dioxins	5.0E-06
PCBs	0.0200

General TMDL Analysis Methodology:

- Composite fish tissue samples were collected and analyzed for the constituents of concern.
- The TMDLs are expressed in lbs/day as a function of flow. To assist with implementation, the TMDLs are also expressed as a maximum water column concentration (μg/L) and as a maximum fish tissue concentration (mg/kg), which are equivalent to the target criteria.
- Waste Load Allocations (WLAs) are derived for point source dischargers of chlordane, dioxins, and PCBs.
- Load Allocations are established for non-point sources using a mass-balance approach.
- Fish tissue monitoring data indicate that levels of chlordane and dioxins are below the target criteria. Therefore, in the absence of data to the contrary, TMDLs were not developed, and TDEC recommends de-listing of the Loosahatchie River for chlordanes and dioxins.

Critical Conditions and Seasonal Variation:

The methodology takes into account that the pollutants are contained in the sediment. The methodology addresses all seasons.

Margin of Safety:

5% (Explicit)

Summary of TMDLs, WLAs, and LAs

Waterbody ID	Pollutant	WLAs	LAs[1]	MOS[1]	TMDLs		
					Maximum Load[1]	Maximum Water Column Concentration[2]	Maximum Fish Tissue Concentration[2]
		(lbs/day)[3]	(lbs/day)[3]	(lbs/day)[3]	(lbs/day)[3]	(μg/L)	(mg/kg)
TN08010209001_1000	PCBs	0	Q_1 * 3.28E-06	Q_1 * 1.73E-07	Q_1 * 3.45E-06	0.00064	0.0200
TN08010209002_1000	PCBs	0	Q_1 * 3.28E-06	Q_1 * 1.73E-07	Q_1 * 3.45E-06	0.00064	0.0200

1 The LA, MOS, and the Maximum Load TMDL are expressed as a function of flow (Q_1), where Q_1 represents the annual average flow of the Loosahatchie River at the pour point of the segment.

2 The TMDL is also expressed in terms of maximum allowable water column concentration and maximum fish tissue concentration because TDEC recognizes that these values provide information that potentially will be more useful regarding TMDL implementation efforts than the values that are expressed in terms of an allowable load.

3 Daily load, in lbs/day, is expressed as an annual average.

TOTAL MAXIMUM DAILY LOADS (TMDLs) FOR CHLORDANE, DIOXIN, AND PCBs IN THE LOOSAHATCHIE RIVER LOOSAHATCHIE RIVER WATERSHED (HUC 08010209)

1.0 INTRODUCTION

Section 303(d) of the Clean Water Act requires each state to list those waters within its boundaries for which technology-based effluent limitations are not stringent enough to protect any water quality standard applicable to such waters. Impaired waters are prioritized with respect to designated use classifications and the severity of pollution. In accordance with this prioritization, states are required to develop Total Maximum Daily Loads (TMDLs) for those waterbodies that are not attaining water quality standards. State water quality standards consist of designated use(s) for individual waterbodies, appropriate numeric and narrative water quality criteria protective of the designated uses, and an antidegradation statement. The TMDL process establishes the maximum allowable loadings of pollutants for a waterbody that will allow the waterbody to maintain water quality standards. The TMDL may then be used to develop controls for reducing pollution from both point and non-point sources in order to restore and maintain the quality of water resources (USEPA, 1991).

2.0 WATERSHED DESCRIPTION

The Loosahatchie River Watershed (HUC 08010209), includes parts of Fayette, Hardeman, Haywood, Shelby, and Tipton counties in southwestern Tennessee (ref.: Figure 1). The watershed lies within three Level III ecoregions (Southeastern Plains, Mississippi Alluvial Plain, and Mississippi Valley Loess Plains) and contains four Level IV subecoregions (USEPA, 1997) as shown in Figure 2.

- The **Southeastern Plains and Hills (65e)** contain several north-south trending bands of sand and clay formations. Tertiary-age sand, clay, and lignite are to the west, and Cretaceous-age fine sand, fossiliferous micaceous sand, and silty clays are to the east. With elevations reaching over 650 feet, and more rolling topography and more relief than the Loess Plains (74b) to the west, streams have increased gradient, generally sandy substrates, and distinctive faunal characteristics for west Tennessee. The natural vegetation type is oak-hickory forest, grading into oak-pine to the north.

- The **Northern Mississippi Alluvial Plain (73a)** within Tennessee is a relatively homogeneous region of Quaternary alluvial deposits of sand, silt, clay, and gravel. It is bounded distinctly on the east by the Bluff Hills (74a), and on the west by the Mississippi River. Average elevations are 250 feet, ranging from near 300 feet in the north near Reelfoot Lake to 215 feet near Memphis in the south. Most of the region is in cropland, with some areas of deciduous forest. Soybeans, cotton, corn, sorghum, and vegetables are the main crops. The natural vegetation consists of Southern floodplain forest (oak, tupelo, bald cypress). The two main distinctions in the Tennessee portion of the ecoregion are between areas of loamy, silty, and sandy soils with better drainage, and areas of more clayey soils of poor drainage that may contain wooded swampland and

oxbow lakes. Waterfowl, raptors, and migratory songbirds are relatively abundant in the region.

- The **Bluff Hills (74a)** consist of sand, clay, silt, and lignite, and are capped by loess greater than 60 feet deep. The disjunct region in Tennessee encompasses those thick loess areas that are generally the steepest, most dissected, and forested. The soils of the region are generally deep, steep, silty, and erosive. The carved loess has a mosaic of microenvironments, including dry slopes and ridges, moist slopes, ravines, bottomland areas, and small cypress swamps. While oak-hickory is the general forest type, some of the undisturbed bluff vegetation is rich in mesophytes, such as beech and sugar maple, with similarities to hardwood forests of eastern Tennessee. Smaller streams of the Bluff Hills have localized reaches of increased gradient and small areas of gravel substrate that create aquatic habitats that are distinct from those of the Loess Plains (74b) to the east. Unique, isolated fish assemblages more typical of upland habitats can be found in these stream reaches.

- The **Loess Plains (74b)** are gently rolling, irregular plains, 250-500 feet in elevation, with loess up to 50 feet thick. The region is a productive agricultural area of soybeans, cotton, corn, milo, and sorghum crops, along with livestock and poultry. Soil erosion can be a problem on the steeper, upland Alfisol soils; bottom soils are mostly silty Entisols. Oak-hickory and southern floodplain forests are the natural vegetation types, although most of the forest cover has been removed for cropland. Some less-disturbed bottomland forest and cypress-gum swamp habitats still remain. Several large river systems with wide floodplains, the Obion, Forked Deer, Hatchie, Loosahatchie, and Wolf, cross the region. Streams are low-gradient and murky with silt and sand bottoms, and most have been channelized. The Hatchie River mainstem supports populations of deer, wild turkeys, beavers, otters, waterfowl, and migratory birds.

Figure 1 Location of the Loosahatchie River Watershed

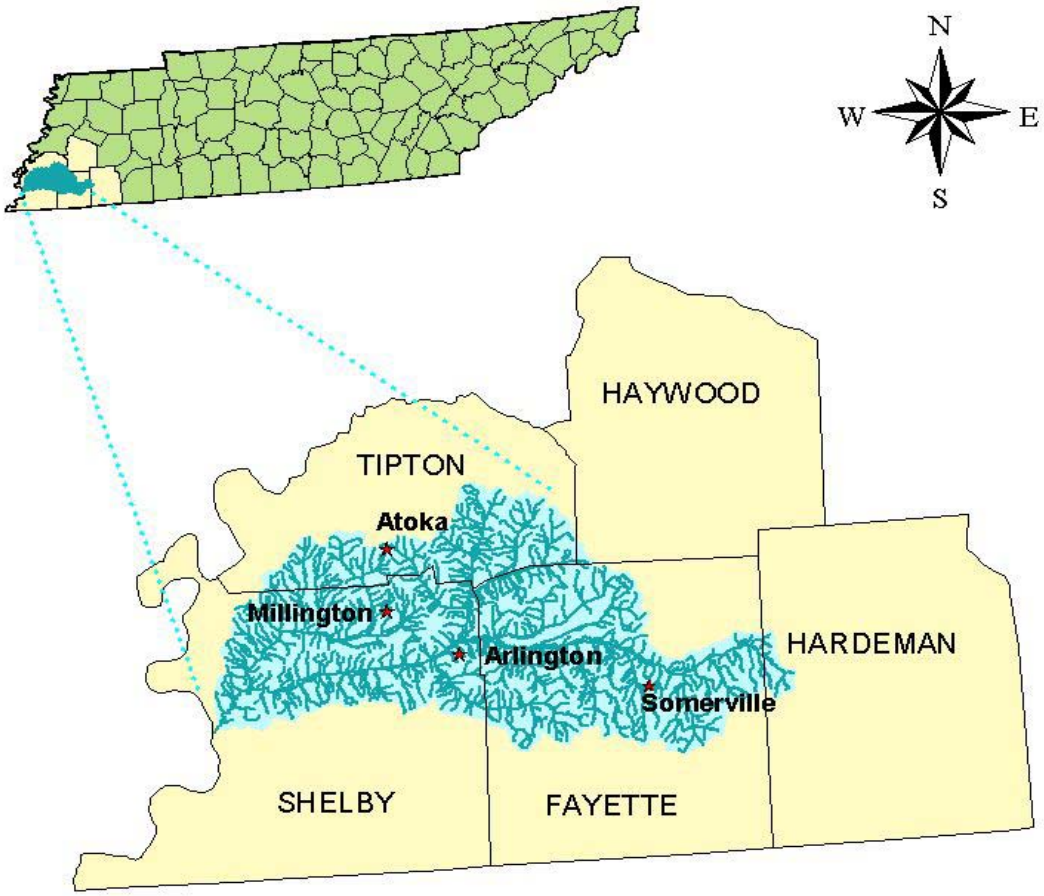
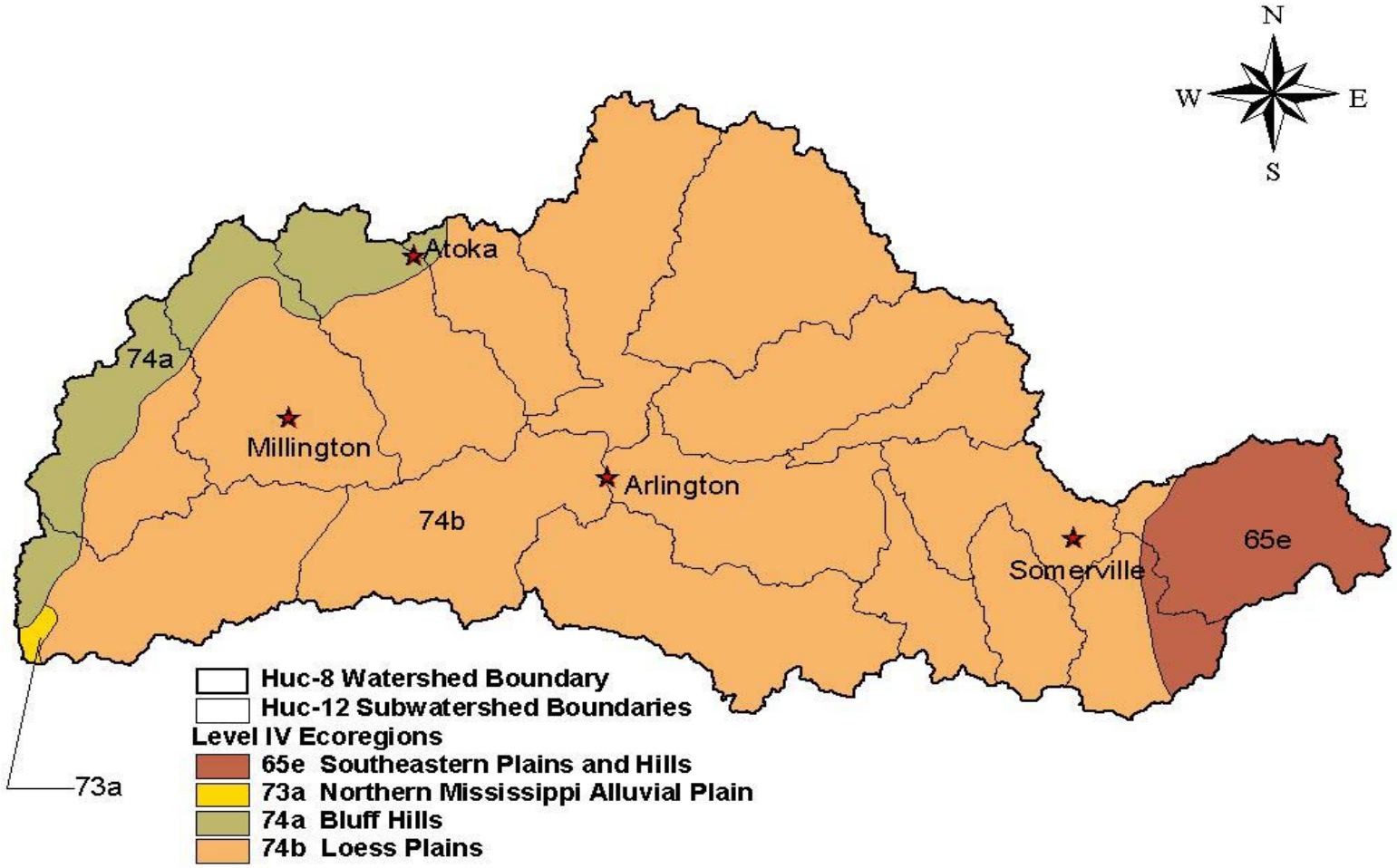


Figure 2 Level IV Ecoregions in the Loosahatchie River Watershed



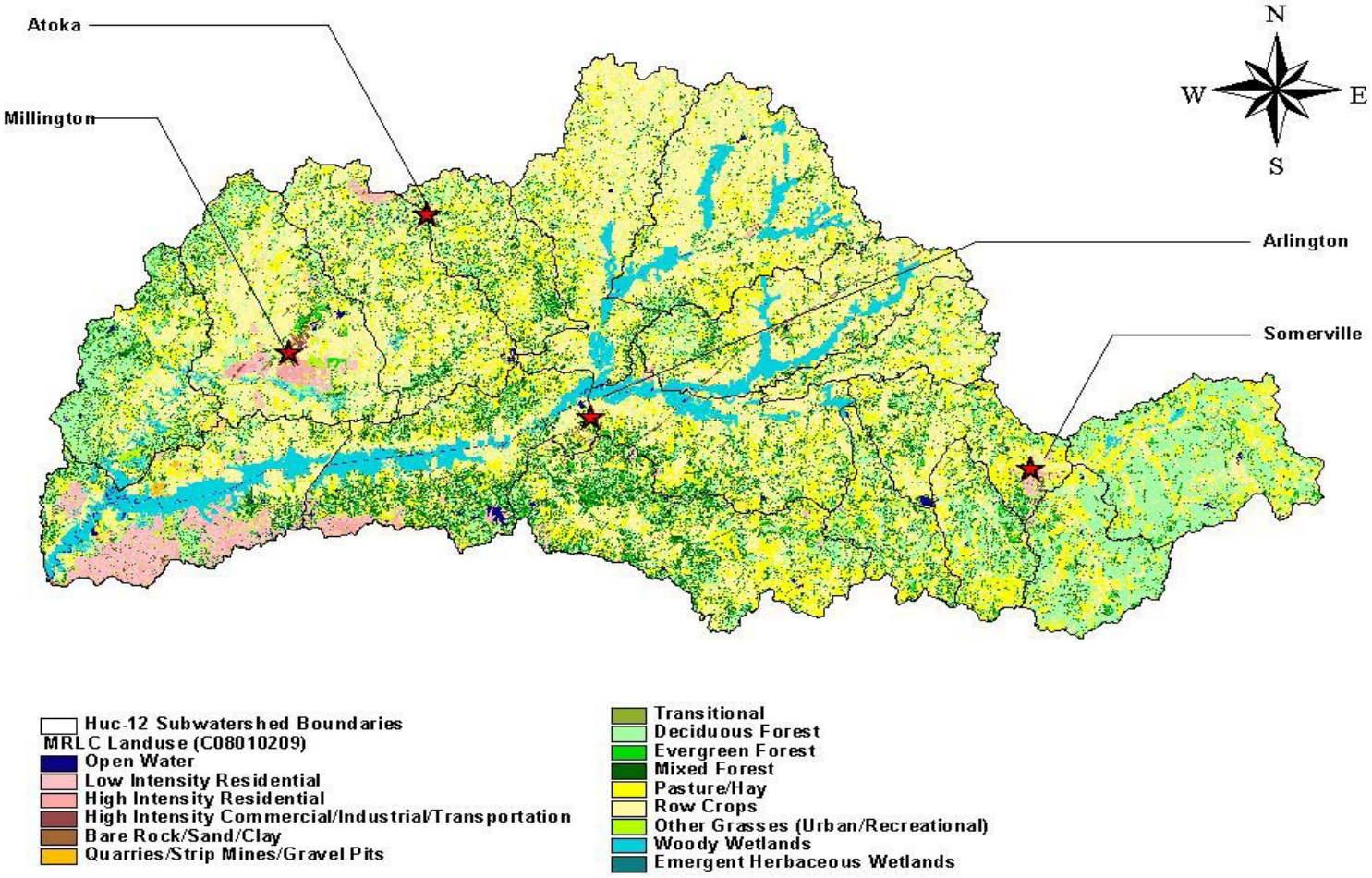
The Loosahatchie River Watershed has approximately 1,436 miles of streams and 81 reservoir/lake acres (TDEC, 2006) and drains approximately 742 square miles into the Mississippi River. Land use distribution is based on the 1992 Multi-Resolution Land Characteristic (MRLC) satellite imagery databases. Table 1 summarizes land use for the Loosahatchie River Watershed, which is shown in Figure 3.

Table 1 Land Use Distribution – Loosahatchie River Watershed

Land Use	Area		% of watershed
	acres	mi^2	
Bare Rock/Sand/Clay	10	0.02	0.00
Deciduous Forest	86,447	135.03	18.21
Evergreen Forest	8,195	12.80	1.73
High Intensity Commercial/Industrial/Transportation	1,817	2.84	0.38
High Intensity Residential	4,087	6.38	0.86
Low Intensity Residential	12,312	19.23	2.59
Mixed Forest	59,309	92.64	12.49
Open Water	4,433	6.92	0.93
Other Grasses	1,164	1.82	0.25
Pasture/Hay	94,203	147.15	19.84
Quarries/Strip Mines/Gravel Pits	258	0.40	0.05
Row Crops	175,566	274.23	36.98
Transitional	389	0.61	0.08
Woody Wetlands	26,629	41.59	5.61
Total	**474,818**	**741.67**	**100.00**

Note: A spreadsheet was used for this calculation and values are approximate due to rounding.

Figure 3 Land Use in the Loosahatchie River Watershed



3.0 PROBLEM DEFINITION

The designated use classifications for the Loosahatchie River include fish and aquatic life, irrigation, livestock watering and wildlife, and recreation. The State of Tennessee's 2008 303(d) List (TDEC, 2008) identified two segments of the Loosahatchie River in the Loosahatchie River Watershed as not fully supporting designated use classifications due, in part, to elevated levels of chlordane, dioxins, and polychlorinated biphenyls (PCBs) in fish tissue samples. An excerpt from the 2008 303(d) List is presented in Table 2. Impaired segments of the Loosahatchie River are shown in Figure 4. Note that there is a fishing advisory for the Loosahatchie River from mile 0.0 to 17.0 (TDEC, 2008a).

3.1 Chlordane

The term chlordane (in association with CAS No. 57-74-9) refers to a mixture of chlordane isomers (approximately 72% cis-chlordane and 23% trans-chlordane) with other chlorinated hydrocarbons and numerous other components. Technical grade chlordane (CAS No. 12789-03-6), on the other hand, has less cis and trans isomers and a larger percentage of the other compounds associated with the CAS No. 57-74-9. Chlordane was first produced in 1947 and was used as an insecticide for agricultural crops and livestock, for lawns and gardens, and also for underground treatment around the foundation of homes. Due to rising concerns over the product's safety, however, the U.S. Environmental Protection Agency began to restrict the use of chlordane on food crops, lawns, and gardens as early as 1978. From 1983 to 1988 the only approved use was as a termiticide around home foundations and all uses were canceled after 1988 except its use for fire ant control in power transformers. Chlordane can still be manufactured in the United States, but it can only be sold to or used by foreign countries (USEPA, 1997a).

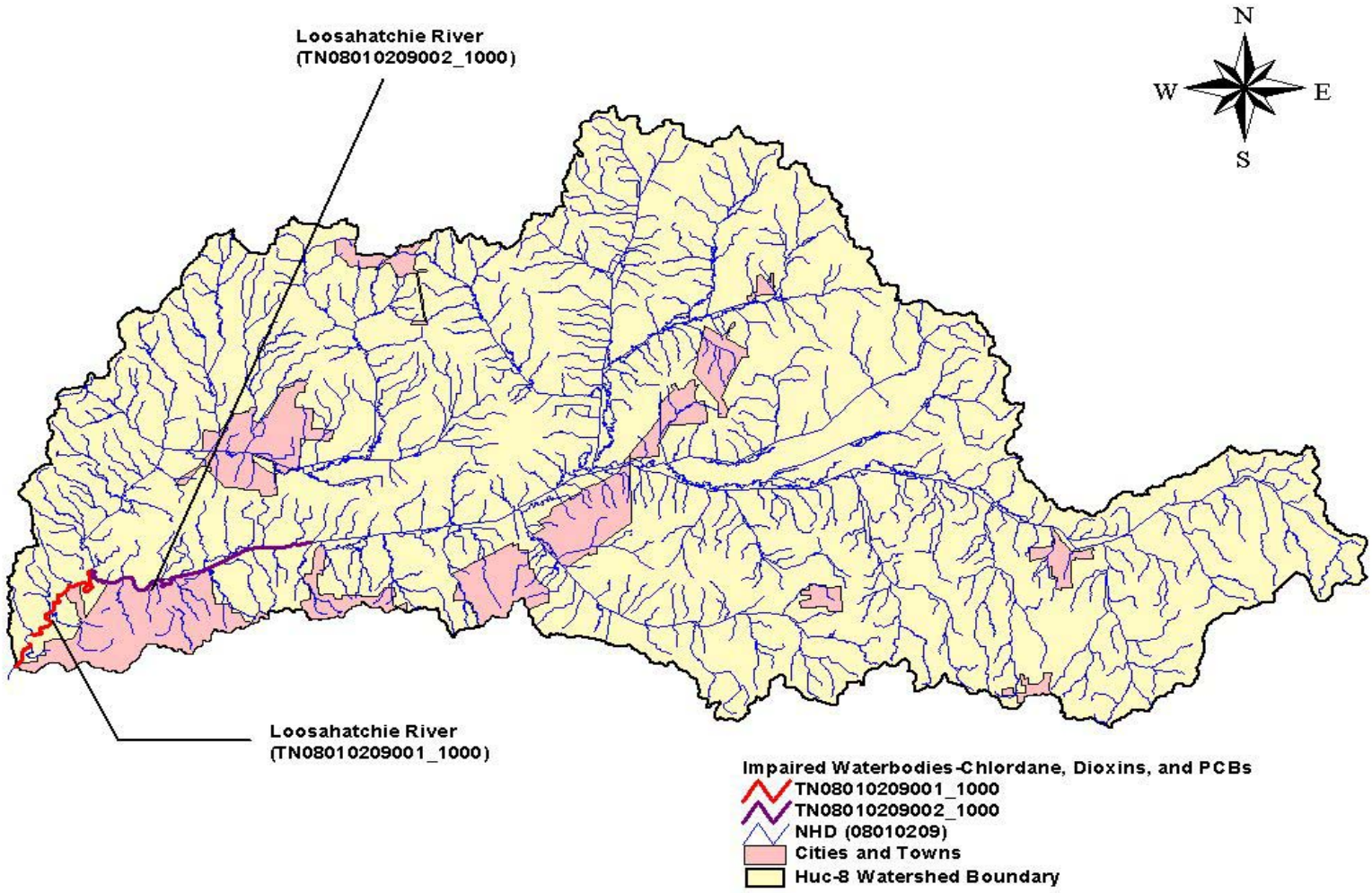
Chlordane is an environmentally persistent and bioaccumulative substance, which the EPA has classified as Group B2 (probable carcinogen). Chlordane residues still exist in soils and sediments and chlordane bioaccumulates in fatty tissue of fish and humans; this bioaccumulation is a current concern. (USEPA, 1997a), Chlordane has the potential to damage liver, kidneys, heart, lungs, spleen and adrenal glands as well as being a potential to cause cancer (USEPA, 2006a).

Table 2 Final 2008 303(d) List for Stream Impairment Due to Chlordane, Dioxins, and PCBs

Waterbody ID	Impacted Waterbody	River Miles Impaired	Cause (Pollutant)	Pollutant Source
TN08010209001_1000 From mouth on Mississippi River to Big Creek	Loosahatchie River	7.8	Mercury PCBs Dioxins Chlordane Loss of biological integrity due to siltation Physical Substrate Habitat Alterations Escherichia coli	Atmospheric Deposition Discharges from MS4 area Contaminated Sediment Channelization
TN08010209002_1000 From Big Creek to Howard Creek.	Loosahatchie River	10.3	Mercury PCBs Dioxins Chlordane Loss of biological integrity due to siltation Physical Substrate Habitat Alterations Escherichia coli	Atmospheric Deposition Discharges from MS4 area Contaminated Sediment Channelization Land Development

Note: There is a fishing advisory on the Loosahatchie River from mile 0.0 to 17.0 (Highway 14, Austin Peay Highway).

Figure 4 Waterbodies Impaired with Chlordane, Dioxins, and PCBs (as documented on the Final *2008 303(d) List*)



3.2 Dioxins

Dioxins are a group of synthetic organic chemicals that contain 210 structurally related (congeners) chlorinated dibenzo-p-dioxins (CDD's) and chlorinated dibenzofurans (CDFs) (USEPA, 1999). Some polychlorinated biphenyls (PCBs) are also regarded as "dioxin-like" in nature. Each congener possesses different physical and chemical properties. As a result, there is a range of toxicity among these structurally related organics. 2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) is the most toxic of any dioxins. Toxic Equivalent Factors (TEFs) were derived to express the toxicity of other dioxins "as a fraction of the toxicity attributed to 2,3,7,8-TCDD" (ATSDR, 1998).

Dioxins are largely created as unintentional by-products of incomplete combustion and various chemical processes, like chlorine bleaching in pulp and paper mills, and as contaminants during the production of some chlorinated organic chemicals such as chlorinated phenols (USEPA, 1999). These chlorinated hydrocarbons are persistent environmental contaminants, with environmental half-lives ranging from years to several decades. According to *An Inventory of Sources and Environmental Releases of Dioxin-Like Compounds in the United States for the Years 1987, 1995, and 2000*, "dioxin-like compounds enter surface water from atmospheric deposition, stormwater runoff erosion, and discharges of anthropogenic wastes" (USEPA, 2006).

Humans are predominately exposed to dioxins through dietary intake. Dioxins have been demonstrated to bioaccumulate in the aquatic food chain; therefore, contaminated fish and shellfish are a primary route of exposure. The exposure to any dioxins is associated with a number of adverse effects. EPA has classified dioxins as Group B2 (probable carcinogen). Furthermore, experiments "have shown toxic effects to the liver, gastrointestinal system, blood, skin, endocrine system, immune system, nervous system, and reproductive system" (USEPA, 1999).

3.3 Polychlorinated Biphenyls (PCBs)

There are approximately 209 congeners of polychlorinated biphenyls. These 209 synthetic organic compounds vary not only in their physical and chemical properties, but also in their toxicity (USEPA, 1999a). PCBs were sold as a mixture that was based upon the percentage of chlorination. Aroclor 1248, 1254, and 1260 indicate the relative percentages 48, 54, 60 percent respectively of chlorination contained in each of these mixtures.

PCBs were manufactured in the United States from the 1920's until 1979 when they were banned by the U.S. Environmental Protection Agency. Prior to this ban, PCBs were commonly used as coolants and lubricants in transformers, capacitors and other electrical equipment. The manufacturing ban on PCBs did not require all PCB-containing materials to be removed from use. Therefore, some PCBs may still be utilized commercially. So, although the production of PCBs has ceased, these chemicals are widely distributed throughout the environment (USEPA, 1999a). Some other products made before 1977 that may contain PCBs include old fluorescent lighting fixtures and electrical devices containing PCB capacitors and old microscope and hydraulic oils (ATSDR, 2001).

As stated in *Fact Sheet: Polychlorinated Biphenyls Update: Impact on Fish Advisories* (USEPA, 1999a):

> Currently, the major source of PCBs is environmental reservoirs from past releases. PCBs have been detected in soil, surface water, air, sediment, plants, and animal tissue in all regions of the earth. PCBs are highly persistent in the environment with reported half-lives in soil and sediment ranging from months to years.

Once in the sediment, PCBs can enter the aquatic food chain. PCBs are fat-soluble chemicals with the potential to concentrate in fish tissue. As a result, humans may be exposed to PCBs through the consumption of contaminated foods, primarily contaminated fish. Studies have demonstrated adverse health effects resulting from PCB exposure. PCBs are classified by EPA as Group B2 (probable carcinogen). PCBs have also been shown to be toxic to the immune system, the reproductive system, the nervous system, and the endocrine system (USEPA, 1999a).

4.0 TARGET IDENTIFICATION

In order for a TMDL to be established, a numeric "target" protective of the uses of the water body segments must be identified to serve as the basis for the TMDL. Fish tissue target criteria will be used in this TMDL because, in the State of Tennessee, assessment of waterbody segments for impairment due to chlordane, dioxins, and PCBs is based on fish tissue concentration. A detailed discussion of the calculations involved in the development of fish tissue target criteria, and the relationship of fish tissue concentrations to published numerical water column criteria, is included in Appendix A. For the purpose of this TMDL, target criteria expressed as the fish tissue concentrations are summarized in Table 3. These values are based on the water quality criteria for the recreation designated use classification.

Table 3 Fish Tissue Target Criteria

Pollutant	Target Criteria (mg/kg)
Chlordane	0.1143
Dioxins	5.0E-06
PCBs	0.0200

5.0 WATER QUALITY ASSESSMENT AND DEVIATION FROM TARGET

Fish tissue samples were collected and analyzed as defined in *The Results of Fish Tissue Monitoring in Tennessee 1992-1997* (TDEC). Fish tissue data were available from three monitoring stations along the Loosahatchie River. Examination of the data shows exceedances of fish tissue target criteria established in Section 4.0. Table 4 presents a summary of the fish tissue monitoring results for these stations compared to the fish tissue target criteria.

However, fish tissue monitoring data indicate that levels of chlordane and dioxins are below the target criteria. Therefore, in the absence of data to the contrary, TMDLs were not developed, and TDEC recommends de-listing of the Loosahatchie River for chlordanes and dioxins.

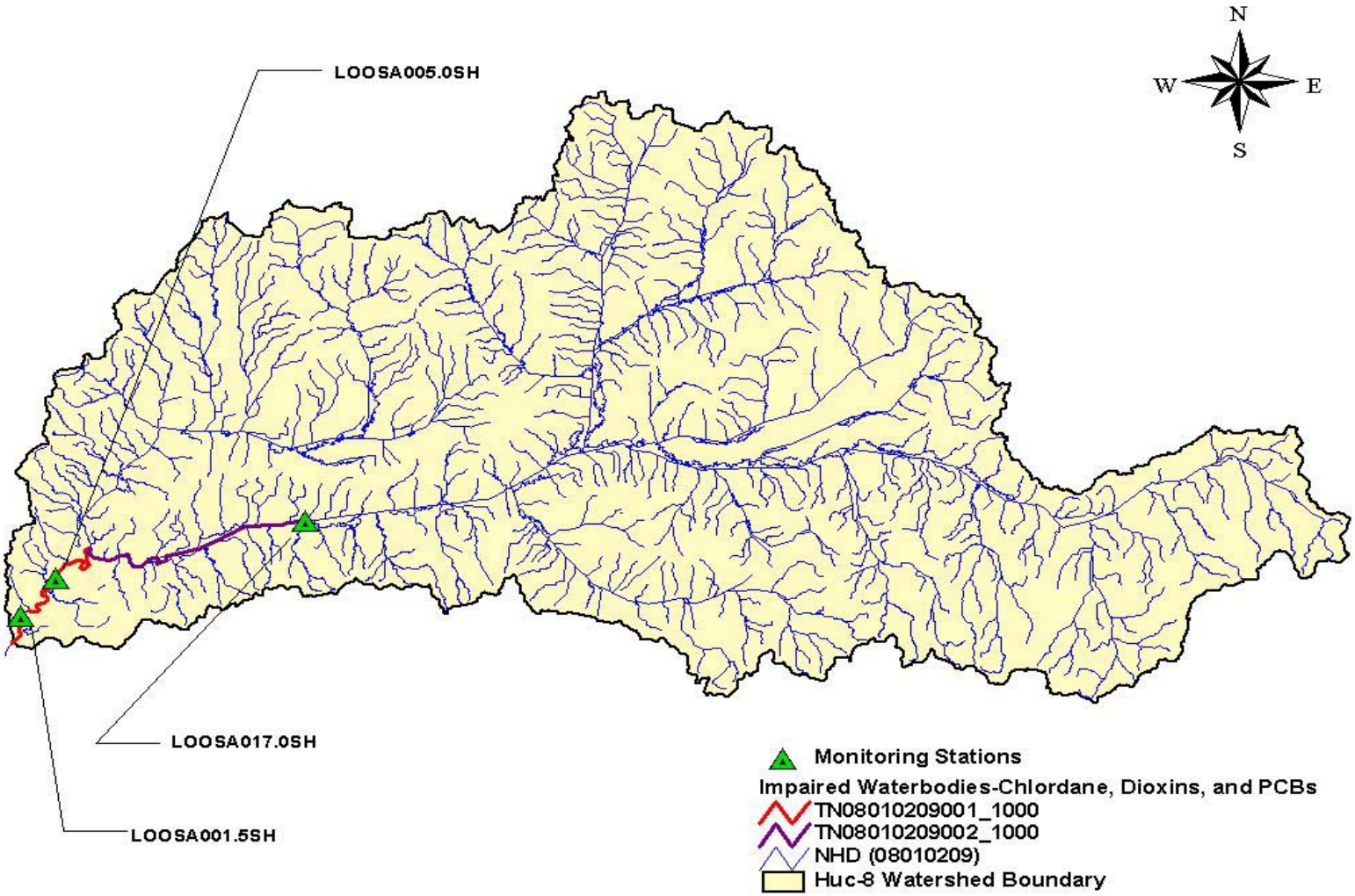
The location of each monitoring station is shown in Figure 5. Fish tissue monitoring results for these stations are tabulated in Appendix B.

Table 4 Fish Tissue Monitoring Data

Monitoring Station	Waterbody ID	Date Range	Pollutant	Data Points	Target (mg/kg)	Max. (mg/kg)	No.* > target
LOOSA001.5SH	TN08010209001_1000	1996	Chlordane	4	0.1143	0.031	0
		1996	Dioxins	3	5.0E-06	0.725E-06	0
		1990-1996	PCBs	5	0.0200	0.225	3
LOOSA005.0SH	TN08010209001_1000	1991-1997	Chlordane	16	0.1143	0.058	0
		1997	Dioxins	4	5.0E-06	2.421E-06	0
		1991-1997	PCBs	16	0.0200	0.262	3
LOOSA017.0SH	TN08010209002_1000	1990-1997	Chlordane	16	0.1143	0.059	0
		1997	Dioxins	4	5.0E-06	2.690E-06	0
		1991-1997	PCBs	15	0.0200	1.760	2

*No.=number that is

Figure 5 Fish Tissue Monitoring Stations



6.0 SOURCE ASSESSMENT

An important part of the TMDL analysis is the identification of individual sources, source categories, or source subcategories of pollutants in the watershed and the amount of pollutant loading contributed by each of these sources. According to the Clean Water Act, sources are broadly classified as either point or non-point sources. Under 40 CFR §122.2, a point source is defined as a discernable, confined, and discrete conveyance from which pollutants are or may be discharged to surface waters. The National Pollutant Discharge Elimination System (NPDES) program regulates point source discharges. Regulated point sources include: 1) municipal and industrial wastewater treatment facilities (WWTFs); 2) storm water discharges associated with industrial activity (which includes construction activities); and 3) certain discharges from Municipal Separate Storm Sewer Systems (MS4s). For the purposes of these TMDLs, all sources of pollutant loading not regulated by NPDES are considered non-point sources.

6.1 Point Sources

There are numerous permitted dischargers in the Loosahatchie River Watershed. However, there are currently no permitted point source dischargers with existing allocations for chlordane, dioxins, or PCBs in the Loosahatchie River Watershed.

6.2 Non-point Sources

Assessments have determined that contaminated sediment is the source of chlordane, dioxin, and PCB impairments in two segments of the Loosahatchie River. There are two NPL sites located in the Loosahatchie River Watershed.

The Arlington Blending and Packaging site (TND980468557) is located in the town of Arlington, Shelby County, Tennessee. The Arlington Blending and Packaging Company (ABAP) operated as a pesticide formulation and packaging company from 1971 to 1978. The ABAP Company blended technical grade pesticides with solvents and emulsifiers and packaged the products for pesticide manufacturers. During the company's operational period, spills and leakage of the products occurred, resulting in the soil and ground-water contamination. In October 1983 EPA had excavated 1920 cubic yards of contaminated surface soils (above 50 ppm chlordane). The site was listed on the National Priority List (NPL) on July 1987. EPA completed its Remedial Investigation and Feasibility Study (RI/FS) in January 1991. Approximately 41,431 tons of subsurface and surficial soils (above 3.3 ppm chlordane) were removed in 1996. Physical cleanup activities at the site have been completed as specified in the Record of Decision (ROD)(USEPA, 1997b). The site was converted to the Mary Alice Park on September 2006. The ABAP site is currently being monitored and a second five year review of the site was completed in 2007 (USEPA, 2007).

The Gallaway Pits site (TND980728992) is located outside the town of Gallaway, in Fayette County, Tennessee. The site has been extensively mined for sand and gravel, resulting in a landscape with water-filled pits up to 50 feet deep. The site as identified by RI/FS encompasses the land area adjacent to and including nine ponds located within a currently inactive (5 acres) portion of a larger (50 acres) active sand and gravel operation. In January 1982, the Tennessee Division of Solid Waste Management (TDSWM) investigated the area upon receiving a tip from a concerned citizen. TDSWM's investigation showed that some of the containers made

reference to ABAP. TDSWM's inspection also revealed that some of the containers had been removed from the pits by ABAP. The Gallaway Pits was placed on the NPL in 1983. Testing of the surface soils and water/sediment showed the presence of pesticides with chlordane being the most prevalent contaminant (USEPA, 1986). Federal and state government agencies collaborated on various efforts to remediate the site. Gallaway Pits was removed from the NPL in 1996 and a five-year review confirmed that the source of contamination had been removed (USEPA, 2000).

These TMDLs will consider contaminated sediments as the primary source of chlordane, dioxins, and PCBs in the Loosahatchie River. The contaminated sediment serves as reservoirs from which these pollutants may be released over a long period of time (USEPA, 1999, 1999a, 2006a).

7.0 DEVELOPMENT OF TOTAL MAXIMUM DAILY LOADS

The TMDL process quantifies the amount of a pollutant that can be assimilated in a waterbody, identifies the sources of the pollutant, and recommends regulatory or other actions to be taken to achieve compliance with applicable water quality standards based on the relationship between pollution sources and in-stream water quality conditions. A TMDL can be expressed as the sum of all point source loads (Waste Load Allocations), non-point source loads (Load Allocations) and an appropriate margin of safety (MOS), which takes into account any uncertainty concerning the relationship between effluent limitations and water quality:

$$TMDL = \Sigma WLAs + \Sigma LAs + MOS$$

The objective of a TMDL is to allocate loads among all of the known pollutant sources throughout a watershed so that appropriate control measures can be implemented and water quality standards achieved. 40 CFR §130.2 (i) states that TMDLs can be expressed in terms of mass per time, toxicity, or other appropriate measure.

7.1 Critical Conditions and Seasonal Variation

Critical conditions were incorporated into the TMDL analysis by using the entire period of record (1990 - 1997) for the fish tissue monitoring data. Fish tissue data were collected during a variety of seasons. Chlordane, dioxin, and PCB concentrations are not expected to fluctuate very much due to the fact that these pollutants are contained mainly in the sediment.

7.2 Margin of Safety

There are two methods for incorporating a Margin of Safety (MOS) in TMDL analysis:
a) implicitly incorporate the MOS using conservative model assumptions to develop allocations; or b) explicitly specify a portion of the TMDL as the MOS and use the remainder for allocations. In these TMDLs, a 5% explicit MOS was incorporated to account for uncertainties.

7.3 Determination of TMDLs

In this document, the TMDLs are daily loads expressed as a function of the annual average flow (daily loading function). The daily load is calculated by multiplying the water quality criterion by the annual average flow (represented by Q) and the required unit conversion factor.

Example: Water quality criterion for PCBs = 0.00064 μg/L
Conversion Factor = 5.39×10^{-3} (lbs-L-sec/(μg-ft^3-day))
Daily Load = Q * 3.45×10^{-6} lbs/day

For implementation purposes, the TMDLs are also expressed as maximum water column concentrations and maximum fish tissue concentrations (as determined in Appendix A).

7.4 Determination of WLAs & LAs

There are currently no permitted point source dischargers with existing allocations for chlordane, dioxins, or PCBs. Waste load allocations (WLAs) of zero are being provided.

The load allocation requires the contribution from non-point sources to be less than or equal to the TMDL target value. In the absence of point sources:

$$LA = TMDL - MOS$$

TMDLs, WLAs, and LAs are summarized in Table 5.

Table 5 TMDLs, WLAs, and LAs for the Loosahatchie River Watershed

Waterbody ID	Pollutant	WLAs	LAs[1]	MOS[1]	TMDLs		
					Maximum Load[1]	Maximum Water Column Concentration[2]	Maximum Fish Tissue Concentration[2]
		(lbs/day)[3]	(lbs/day)[3]	(lbs/day)[3]	(lbs/day)[3]	(μg/L)	(mg/kg)
TN08010209001_1000	PCBs	0	Q_1 * 3.28E-06	Q_1 * 1.73E-07	Q_1 * 3.45E-06	0.00064	0.0200
TN08010209002_1000	PCBs	0	Q_1 * 3.28E-06	Q_1 * 1.73E-07	Q_1 * 3.45E-06	0.00064	0.0200

1 The LA, MOS, and the Maximum Load TMDL are expressed as a function of flow (Q_1), where Q_1 represents the annual average flow of the Loosahatchie River at the pour point of the segment.

2 The TMDL is also expressed in terms of maximum allowable water column concentration and maximum fish tissue concentration because TDEC recognizes that these values provide information that potentially will be more useful regarding TMDL implementation efforts than the values that are expressed in terms of an allowable load.

3 Daily load, in lbs/day, is expressed as an annual average.

8.0 IMPLEMENTATION PLAN

8.1 Point Sources

There are currently no NPDES permitted facilities in the Loosahatchie River Watershed with an existing allocation to discharge chlordane, dioxins, or PCBs to the Loosahatchie River.

8.2 Non-point Sources

The Tennessee Department of Environment & Conservation (TDEC) has no direct regulatory authority over most non-point source discharges. Voluntary, incentive-based mechanisms will be used to implement non-point source management measures in order to assure that measurable reductions in pollutant loadings can be achieved for the impaired waterbody.

Two segments of the Loosahatchie River were listed as impaired on the *2008 303(d) List* because they were not fully supporting designated use classifications due, in part, to elevated levels of chlordane, dioxins, and PCBs. Contaminated sediment was identified as the likely source for chlordane, dioxin, and PCB contamination in the Loosahatchie River.

There are generally two options to prevent chlordane, dioxins, and PCBs contained in the sediment from being released to the waterbody: 1) avoid disturbing the sediment or 2) remediate contaminated sites. TDEC recommends using option one whenever possible. On the other hand, if the sediment in the riverbed must be disturbed, remediation efforts will be necessary to control the load of chlordane, dioxins, and PCBs in the river so that the water quality criteria are not exceeded. Strategies to identify sites with elevated levels of chlordane, dioxins, and PCBs may be helpful for implementing controls to prevent the contaminants from being released into the river. As less of the contaminants become biologically available the concentrations of chlordane, dioxins, and PCBs measured in fish tissue samples should theoretically decline. Most importantly, continued fish tissue monitoring is advised to ensure that contamination decreases as time passes. This will help determine if additional loading is occurring.

8.3 Evaluation of TMDL Implementation Effectiveness

The effectiveness of these TMDLs will be assessed as data become available or when necessary. Watershed monitoring and assessment activities will provide information by which the effectiveness of chlordane, dioxin, and PCB load allocations can be evaluated. Continued fish tissue sampling will be necessary to monitor the efficacy of the proposed TMDLs. These results will be reevaluated during subsequent water quality assessment cycles as required by the Clean Water Act.

9.0 PUBLIC PARTICIPATION

In accordance with 40 CFR §130.7, the proposed TMDLs for chlordane, dioxins, and PCBs in the Loosahatchie River were placed on Public Notice for a 35-day period and comments were solicited. Steps taken in this regard include:

1) Notice of the proposed TMDLs was posted on the Tennessee Department of Environment and Conservation website. The notice invited public and stakeholder comments and provided a link to a downloadable version of the TMDL document.

2) Notice of the availability of the proposed TMDLs (similar to the website announcement) was included in one of the NPDES permit Public Notice mailings, which were sent to interested persons or groups who have requested this information.

3) A letter was sent to identified water quality partners in the Loosahatchie River Watershed advising them of the proposed chlordane, dioxins, and PCB TMDLs and their availability on the TDEC website. The letter also stated that a written copy of the Draft TMDL document would be provided upon request. A letter was sent to the following partners:

Natural Resources Conservation Service
Tennessee Department of Agriculture
Tennessee Water Sentinels
United States Army Corps of Engineers
United States Fish and Wildlife Service
United States Geological Survey
Nature Conservancy

4) A draft copy of the proposed TMDLs was sent to the following MS4s:

TNS068276	Memphis Municipal Separate Storm Sewer System
TNS075663	Shelby County
TNS077585	Tennessee Department of Transportation

10.0 FURTHER INFORMATION

Further information concerning Tennessee's TMDL program can be found on the Internet at the Tennessee Department of Environment and Conservation website:

http://www.state.tn.us/environment/wpc/tmdl/

Technical questions regarding these TMDLs should be directed to the following members of the Division of Water Pollution Control staff:

Ron W. Gipson, Watershed Management Section
E-mail: Ronnie.Gipson@state.tn.us

Vicki S. Steed, P.E., Watershed Management Section
E-mail: Vicki.Steed@state.tn.us

Sherry H. Wang, Ph.D., Watershed Management Section
E-mail: Sherry.Wang@state.tn.us

11.0 REFERENCES

ATSDR. 1998. *Toxicological Profile for Chlorinated Dibenzo-p-dioxins (CDDs).* U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. December 1998.

ATSDR. 2001. *Toxicological Frequently asked Questions-Polychlorinated Biphenyls.* U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. February 2001.

TDEC. *The Results of Fish Tissue Monitoring in Tennessee 1992-1997.* Tennessee, Department of Environment and Conservation, Division of Water Pollution Control.

TDEC. 2002. *Dioxin Levels in Pigeon River Fish 1996-2002.* Tennessee Department of Environment and Conservation, Division of Water Pollution Control. October 2002.

TDEC. 2006. *2006 305(b) Report: The Status of Water Quality in Tennessee*, Tennessee Department of Environment and Conservation, Division of Water Pollution Control. April 2006.

TDEC. 2007. *State of Tennessee Water Quality Standards, Chapter 1200-4-3 General Water Quality Criteria, October 2007.* Tennessee Department of Environment and Conservation, Division of Water Pollution Control. Approved March 2008.

TDEC. 2008. *Final Version, Year 2008 303(d) List.* Tennessee Department of Environment and Conservation, Division of Water Pollution Control, June 2008. This document is available from the TDEC website at: http://state.tn.us/environment/wpc/publications/2008_303d.pdf.

TDEC. 2008a. *Bacteriological and Fishing Advisories in Tennessee.* Tennessee Department of Environment and Conservation, Division of Water Pollution Control. May 2008.

USEPA. 1986. *Record of Decision*: Gallaway Pits, U.S. Environmental Protection Agency, Region 4, Atlanta Georgia. September 1986.

USEPA. 1991. *Guidance for Water Quality-based Decisions: The TMDL Process.* U.S. Environmental Protection Agency, Office of Water, Washington, DC. EPA-440/4-91-001. April 1991.

USEPA. 1997. *Ecoregions of Tennessee*. U.S. Environmental Protection Agency, National Health and Environmental Effects Research Laboratory, Corvallis, Oregon. EPA/600/R-97/022.

USEPA. 1997a. *Toxicological Review of Chlordane (Technical) (CAS No. 12789-03-6) In Support of Summary Information on the Integrated Risk Information System (IRIS).* U.S. Environmental Protection Agency, Washington, DC. December 1997.

USEPA. 1997b. *Record of Decision Amendment*: Arlington Blending & Packaging, U.S. Environmental Protection Agency, Region 4, Atlanta Georgia. EPA/AMD/R04-97/183. July 1997.

USEPA. 1998. Report of the Federal Advisory Committee on the Total Maximum Daily Load (TMDL) Program. U.S Environmental Protection Agency, Office of the Administrator, Washington, DC. EPA 100-R-98-006. July 1998.

USEPA. 1999. *Fact Sheet: Polychlorinated Dibenzo-p-dioxins and Related Compounds Update: Impact on Fish Advisories*. U.S. Environmental Protection Agency, Office of Water, Washington, DC. EPA-823-F-99-015. September 1999.

USEPA. 1999a. *Fact Sheet: Polychlorinated Biphenyls (PCBs) Update: Impact on Fish Advisories*. U.S. Environmental Protection Agency, Office of Water, Washington, DC. EPA-823-F-99-019. September 1999.

USEPA. 2000. *Five Year Review,* U.S. Environmental Protection Agency, Region 4, Atlanta, Georgia. September 2000.

USEPA. 2002. *National Recommended Water Quality Criteria: 2002; Human Health Criteria Calculation Matrix*. EPA-822-R-02-012. November 2002.

USEPA. 2006. *An Inventory of Sources and Environmental Releases of Dioxin-Like Compounds in the United States for the Year 1987, 1995, and 2000.* U.S. Environmental Protection Agency, Office of Research and Development, National Center for Environmental Assessment, Washington, DC. EPA/600/P-03/002F. November 2006.

USEPA. 2006a. *Technical Factsheet: Chlordane.* U.S Environmental Protection Agency, Office of Water, Washington, DC. November 2006.

USEPA. 2007. *Second Five Year Review Report For Arlington Blending and Packing Site.* U.S. Environmental Protection Agency, Region 4, Atlanta, Georgia. September 2007.

USEPA. 2007a. Federal Register/Vol. 72/Thursday, May 10, 2007/Rules and Regulations. May 2007.

APPENDIX A

Development of Target Criteria For Chlordane, PCBs, and Dioxins

In the State of Tennessee, assessment of waterbody segments for impairment due to chlordane, dioxins, and PCBs is based on fish tissue concentrations. Public fishing advisories are also based upon fish tissue concentrations. Therefore, for the purpose of this TMDL, development of target criteria will be based on fish tissue concentration.

Chlordane and PCB Methodology

The formula for calculating the fish tissue concentration requiring a fish advisory is established by *State of Tennessee Water Quality Standards, Chapter 1200-4-3, General Water Quality Criteria, October 2007* (TDEC, 2007). Section 1200-4-3-.03 (4) (l) is summarized below:

$$R = q * E \quad \text{(Equation A-1)}$$

where:

R = Plausible-upper-limit risk of cancer associated with a chemical in a fish species; in Tennessee, a risk level of 10^{-5} is used when considering a fish advisory
q = Carcinogenic Potency Factor for the specific chemical (kg-day/mg)
E = Exposure dose of the specific chemical (mg/kg-day) from the fish species

E is calculated based on the following formula:

$$E = C * I * X / W \quad \text{(Equation A-2)}$$

where:

C = Concentration of the chemical (mg/kg) in the edible portion of the fish species
I = Ingestion rate (g/day) of the fish species; 17.5 g/day will be used (USEPA, 2002)
X = Relative absorption coefficient; assumed to be 1.0
W = Average human mass (kg); 70 kg will be used (USEPA, 2002)

Combining equations A-1 and A-2 and solving for fish tissue concentration (C) results in the following equation:

$$C = (R * CF1 * W) / (q * I * X) \quad \text{(Equation A-3)}$$

where:

CF1 = Conversion Factor (1000 g/kg)

Once the fish tissue target concentration has been determined using Equation A-3, the corresponding water column concentration can be determined using the following equation:

$$C_{water} = [C_{fish} * CF2] / BCF \quad \text{(Equation A-4)}$$

where:

CF2 = Conversion Factor (1000 μg/mg)
BCF = Bioconcentration Factor (L/kg)

Using Equations A-3 and A-4 and published values for q and BCF (USEPA, 2002), the target fish tissue concentrations were calculated for the waterbodies (TN08010209001_1000 and TN08010209002_1000).

Table A-1 Target Fish Tissue Concentrations

Pollutant	q	C_{fish}	BCF	C_{water}
	(kg-day/mg)	(mg/kg)	(L/kg)	(μg/L)
Chlordane	0.35	0.1143	14,100	0.0081
PCB	2.0	0.0200	31,200	0.00064

The fish tissue concentrations given in Table A-1 were calculated using the methodology developed on the previous page. These fish tissue concentrations are more stringent than the fish tissue concentrations calculated from the water column criteria established for the fish and aquatic life use classification. Therefore, the fish tissue concentrations in Table A-1 will be used as the target criteria for this TMDL.

Dioxin Methodology

For dioxin, a different methodology is used to determine water quality criterion and the fish advisory level. The fish tissue concentration requiring a fish advisory is based on the water quality criterion as established by *State of Tennessee Water Quality Standards, Chapter 1200-4-3, General Water Quality Criteria, October 2007* (TDEC, 2007). The water quality criterion is based on a combination of EPA and USFDA assumptions and was approved by EPA in 1999. (For a more complete explanation, see *Dioxin Levels in Pigeon River Fish: 1996-2002* [TDEC, 2002]). The water criterion of 1 ppq is multiplied by the bioconcentration factor for dioxin and the appropriate conversion factor:

$$C_{fish} = [C_{water} * BCF] / CF2 \qquad \text{(Equation A-5)}$$

where:

CF2 = Conversion Factor (1000 μg/mg)
BCF = Bioconcentration Factor (5,000 L/kg)

The resulting fish tissue concentration is:

$$C_{fish} = [(1x10^{-6} \ \mu g/L) * (5000 \ L/kg)] / (1000 \ \mu g/mg) = 5x10^{-6} \ mg/kg$$

where:

$1 \ ppq = 1x10^{-6} \ \mu g/L$

Therefore, the fish tissue concentration calculated from Equation A-5 ($5x10^{-6}$ mg/kg) will be used as the target criterion for this TMDL.

APPENDIX B

Fish Tissue Monitoring Data For Chlordane, Dioxins, and PCBs

There are three monitoring stations that provide fish tissue data for portions of the Loosahatchie River identified as impaired for chlordane, dioxins, and PCBs. The location of these monitoring stations is shown in Figure 5. Fish tissue data recorded at these stations are tabulated in Tables B-1 thru B-3.

In Table B-1, total chlordane was calculated as the sum of alpha chlordane, gamma chlordane, cis-nonachlor, and trans-nonachlor.

In Table B-2, total dioxins were calculated as the sum of the concentrations of all polychlorinated dibenzo-p-dioxins (CDDs) and and polychlorinated dibenzofuran (CDFs) isomers after multiplication by the appropriate Toxic Equivalent Factor (TEF):

$$C_{dioxins} = \Sigma [C_i \times TEF_i]$$

where:

$C_{dioxins}$ = Total dioxins measured in fish tissue samples (ppt)
C_i = Concentration of isomer *i* in fish tissue samples (ppt)
TEF_i = Toxic Equivalent Factor specific for isomer

The TEF approach compares the relative potential toxicity of each dioxin like compound in the mixture to the toxicity of 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD), the most toxic member of the group. The TEF for 2,3,7,8-TCDD is defined as unity; and the TEFs for all other polychlorinated dibenzo-p-dioxins (CDD), polychlorodibenzofurans (CDF), and certain coplanar polychlorinated biphenyls (PCBs) are defined with values that are less than one which reflects their lower toxic potency relative to 2,3,7,8 TCDD (USEPA, 2006).

The TEFs used in this TMDL were recommended by the EPA (USEPA, 2007a).

In Table B-3, PCB data presented is for the sum of Aroclor 1254 and Aroclor 1260.

Table B-1 Fish Tissue Monitoring Data for Chlordane

Monitoring Station ID	Date	Fish Species	Total Chlordane mg/kg
LOOSA001.5SH	7/23/96	Flathead Catfish	0.008
	7/23/96	Channel Catfish	0.031
	7/23/96	Carp	0.022
	7/23/96	Bigmouth Buffalo	0.012
LOOSA005.0SH	11/19/91	Bigmouth Buffalo	ND
	11/19/91	Black Buffalo	0.050
	11/19/91	Channel Catfish	ND
	11/19/91	Channel Catfish	ND
	11/19/91	Channel Catfish	0.013
	11/19/91	Channel Catfish	0.013
	11/19/91	Channel Catfish	0.023
	11/19/91	Carp	ND
	11/19/91	Carp	ND
	11/19/91	Carp	ND
	11/19/91	Carp	0.017
	11/19/91	Carp	0.005
	10/28/97	Bigmouth Buffalo	0.007
	10/28/97	Carp	0.032
	10/28/97	Channel Catfish	0.058
	10/28/97	Channel Catfish	0.042
LOOSA017.0SH	11/14/90	Carp	0.049
	10/23/91	Carp	ND
	10/23/91	Carp	ND
	10/23/91	Carp	0.030
	10/23/91	Carp	0.030
	10/23/91	Carp	0.030
	10/23/91	Largemouth Bass	0.030
	10/23/91	Channel Catfish	ND
	10/23/91	Channel Catfish	ND
	10/23/91	Channel Catfish	0.030
	10/23/91	Channel Catfish	0.020
	10/23/91	Channel Catfish	0.020
	10/28/97	Bigmouth Buffalo	0.059
	10/28/97	Carp	0.013
	10/28/97	Channel Catfish	0.013
	10/28/97	Drum	0.014

Table B-2 Fish Tissue Monitoring Data for Dioxins

Monitoring Station ID	Date	Fish Species	Total Dioxins ppt
LOOSA001.5SH	7/23/96	Flathead Catfish	0.219
	7/23/96	Channel Catfish	0.725
	7/23/96	Carp	0.661
LOOSA005.0SH	10/28/97	Bigmouth Buffalo	0.055
	10/28/97	Carp	1.624
	10/28/97	Channel Catfish	2.421
	10/28/97	Channel Catfish	1.170
LOOSA017.0SH	10/28/97	Bigmouth Buffalo	2.690
	10/28/97	Carp	0.435
	10/28/97	Channel Catfish	1.840
	10/28/97	Drum	0.142

Table B-3 Fish Tissue Monitoring Data for PCBs

Monitoring Station ID	Date	Fish Species	Total PCBs mg/kg
LOOSA001.5SH	11/14/90	Carp	0.225
	7/23/96	Bigmouth Buffalo	ND
	7/23/96	Channel Catfish	0.046
	7/23/96	Carp	0.046
	7/23/96	Flathead Catfish	ND
LOOSA005.0SH	11/19/91	Black Buffalo	ND
	11/19/91	Bigmouth Buffalo	ND
	11/19/91	Channel Catfish	ND
	11/19/91	Channel Catfish	ND
	11/19/91	Channel Catfish	ND
	11/19/91	Channel Catfish	ND
	11/19/91	Channel Catfish	ND
	11/19/91	Carp	ND
	11/19/91	Carp	ND
	11/19/91	Carp	ND
	11/19/91	Carp	ND
	11/19/91	Carp	ND
	10/28/97	Bigmouth Buffalo	ND
	10/28/97	Carp	0.189
	10/28/97	Channel Catfish	0.262
	10/28/97	Channel Catfish	0.182
LOOSA017.0SH	10/23/91	Carp	1.760
	10/23/91	Carp	ND
	10/23/91	Carp	ND
	10/23/91	Carp	ND
	10/23/91	Carp	ND
	10/23/91	Largemouth Bass	ND
	10/23/91	Channel Catfish	ND
	10/23/91	Channel Catfish	ND
	10/23/91	Channel Catfish	ND
	10/23/91	Channel Catfish	ND
	10/23/91	Channel Catfish	ND
	10/28/97	Carp	ND
	10/28/97	Channel Catfish	ND
	10/28/97	Bigmouth Buffalo	1.190
	10/28/97	Drum	ND

APPENDIX C

Public Notice Announcement

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF WATER POLLUTION CONTROL

PUBLIC NOTICE OF AVAILABILITY OF PROPOSED TOTAL MAXIMUM DAILY LOAD (TMDLS) FOR DIOXINS, AND POLYCHLORINATED BIPHENYLS FOR LOOSAHATCHIE RIVER IN THE LOOSAHATCHIE RIVER WATERSHED (HUC 08010209), TENNESSEE

Announcement is hereby given of the availability of Tennessee's proposed Total Maximum Daily Loads (TMDLs) for chlordane, dioxins, and polychlorinated biphenyls (PCBs) for the Lossahatchie River in the Loosahatchie River Watershed, located in western Tennessee. Section 303(d) of the Clean Water Act requires states to develop TMDLs for waters on their impaired waters list. TMDLs must determine the allowable pollutant load that the water can assimilate, allocate that load among the various point and nonpoint sources, include a margin of safety, and address seasonality.

The Loosahatchie River was identified on Tennessee's Final 2008 303(d) list as not supporting designated use classifications due to elevated levels of chlordane, dioxins and polychlorinated biphenyls (PCBs) in fish tissue samples. Contaminated sediments are the source of pollutant causes associated with both impairments. Using a mass-balance approach, the TMDLs utilize Tennessee's general water quality criteria, fish tissue sampling data collected from Loosahatchie River, Bioconcentration Factors defined by the U.S. Environmental Protection Agency, and an appropriate Margin of Safety (MOS) to establish chlordane, dioxin and PCB loading levels which will result in lower fish tissue concentrations and the attainment of water quality standards.

The proposed chlordane, dioxin and PCB TMDLs may be downloaded from the Department of Environment and Conservation website:

http://www.state.tn.us/environment/wpc/tmdl/

Technical questions regarding this TMDL should be directed to the following members of the Division of Water Pollution Control staff:

Ron W. Gipson, Watershed Management Section
Telephone: 615-253-5348

Vicki S. Steed, P.E., Watershed Management Section
Telephone: 615-532-0707

Sherry H. Wang, Ph.D., Watershed Management Section
Telephone: 615-532-0656

Persons wishing to comment on the proposed TMDL are invited to submit their comments in writing no later than September 15, 2008 to:

Division of Water Pollution Control
Watershed Management Section
7th Floor, L & C Annex
401 Church Street
Nashville, TN 37243-1534

All comments received prior to that date will be considered when revising the TMDL for final submittal to the U.S. Environmental Protection Agency.

The TMDL and supporting information are on file at the Division of Water Pollution Control, 6th Floor, L & C Annex, 401 Church Street, Nashville, Tennessee. They may be inspected during normal office hours. Copies of the information on file are available on request.

APPENDIX D

Public Comments Received

City of Memphis
TENNESSEE

DR. WILLIE W. HERENTON - Mayor
KEITH L. McGEE - Chief Administrative Officer
DIVISION OF PUBLIC WORKS
DWAN L. GILLIOM - Director
Storm Water Program

September 12, 2008

Mr. Dennis Borders
Tennessee Department of Environment and Conservation
Division of Water Pollution Control
401 Church Street
L&C Annex, Seventh Floor
Nashville, Tennessee 37243-1534

Re: Comments for Proposed Total Maximum Daily Load for Chlordane, Dioxins, and Polychlorinated Biphenyls (PCBs)
Loosahatchie River Watershed, Tennessee

Dear Mr. Borders:

On August 11, 2008 the City of Memphis received a draft copy of the proposed Total Maximum Daily Load (TMDL) for Chlordane, Dioxins, and PCBs for the Loosahatchie River Watershed (HUC 08010209) in Tennessee. We have reviewed the above referenced document.

As stated, fish tissue samples were collected and analyzed from 1992 - 1997. Data was available from three monitoring stations along the Loosahatchie River. Given that tissue results are more than 10 years old, the City believes it would be prudent to collect additional samples before finalization of the TMDL in order to confirm that the older results are still representative of current conditions.

If you have any questions concerning this correspondence please contact Scott Morgan at (901) 576-4345.

Sincerely,

Scott Morgan
City of Memphis – Storm Water Program
F:\APPS\STORM WATER\TMDL\Loosahatchie\Comments-Loosahatchie proposed TMDL.doc

c: Mr. Paul Patterson – City of Memphis
Mr. Ron Kirby – City of Memphis

APPENDIX E

Response to Public Comments

TDEC thanks the City of Memphis for their interest in reviewing the draft version of this TMDL. TDEC's response to their comments is summarized below:

1. TMDLs are developed using the fish tissue data currently available. EPA's *Report of the Federal Advisory Committee on the Total Maximum Daily Load Program*, EPA 100-R-98-006 states "lack of certainty must not delay TMDL development" (USEPA, 1998). TDEC agrees that additional monitoring data would be desirable. However according to EPA's *Guidance for Water Quality-based Decisions: The TMDL Process*, EPA 440/4-91-001, "Lack of information about certain types of pollution problems (for example, those associated with nonpoint sources or with certain toxic pollutants) should not be used as a reason to delay implementation of water quality-based controls" (USEPA, 1991). As stated in Section 8.3, continued fish tissue sampling will be necessary.